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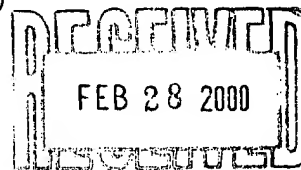
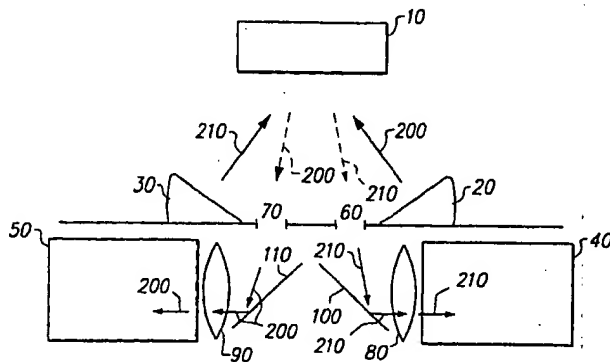
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International Bureau



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(54) Title: STEREO HEAD MOUNTED DISPLAY USING A SINGLE DISPLAY DEVICE



(57) Abstract

A single display device (10) is mounted within a head-worn apparatus to produce both a left image and a right image. The left image is directed to a right eye of the user, and the right image is directed to the left eye of the user. When in the stereoscopic mode, the right and left images differ from each other such that when viewed by the user, the combined right and left images give the user a stereoscopic, three-dimensional effect. When worn on the head of the user, the device is properly aligned to provide the left image to the right eye and the right image to the left eye. Further, as the user moves, the present invention remains properly aligned such that the user can continue viewing the image with the right eye and the right image with the left eye independent of movement by the user so long as the user keeps wearing the device. A plurality of pixels are collected as the display (10), wherein each pixel is formed of a grating light valve. The modulation of light by the grating light valve is configured to be accomplished sequentially and also sufficiently fast to multiplex both complete right and left images in a single time frame thereby preventing flicker. By using a single display, the device is inherently aligned to produce accurate right and left images viewed by each respective eye without internal adjustments. Further, by using the grating light valve, the user is only exposed to reflected light rather than to harmful radiation such as from a cathode ray tube. Additionally, forming the display of grating light valves allows formation of two images without the use of any filters owing to the speed of grating light valves.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/12193

A. CLASSIFICATION OF SUBJECT MATTER

G02B27/22, G02B26/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G02B, H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2296152 A (GEC-MARCONI AVIONICS LTD.) 15 June 1996, page 2, line 16 - page 4, line 17, page 6, line 20 - page 10, line 16.	1, 5, 6
A		2, 7, 10-13, 15-19, 22, 23, 25, 26, 28, 29
Y	GB 2319424 A (DAEWOO ELECTRONICS CO. LTD.) 20 May 1998, fig. 4, 5, 7, page 5, line 14 - page 6, line 11, page 7, line 21 - page 8, line 16.	1, 5, 6

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☐ Patent family members are listed in annex.

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Date of the actual completion of the international search
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INTERNATIONAL SEARCH REPORT

International Application No.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	--	7, 10, 15, 16
A	WO 94/29761 A (A.T.M.A.S.R.L.) 22 December 1994, fig. 1-4, 8.	1, 5, 7, 10, 15, 16, 22, 28
A	WO 97/22033 A (STREET, G.S.B.) 19 June 1997, abstract, page 8, line 15 - page 12, line 9, page 13, line 28 - page 14, line 9.	1, 5, 7, 10, 15, 16, 22, 28
A, P	WO 98/41893 A (SILICON LIGHT MACHINES, INC.) 24 September 1998, fig. 4, 5, 8, 8A, 9-11, 18, page 18, lines 7-12 (cited in the application).	1-4, 6, 7-9, 11, 15, 17, 22- 24, 25, 26, 28, 29

ANHANG

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bericht über die internationale
Patentanmeldung Nr.

ANNEX

to the International Search
Report to the International Patent
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ANNEXE

au rapport de recherche inter-
national relatif à la demande de brevet
international n°

PCT/US 99/12193 SAE 239316

In diesem Anhang sind die Mitglieder
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nannten internationalen Recherchenbericht
angeführten Patentdokumente angegeben.
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This Annex lists the patent family
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cited in the above-mentioned inter-
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In Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
GB A1 2296152	19-06-1996	GB A0 9425119 GB A0 9501859 GB B2 2296152	15-02-1995 22-03-1995 07-07-1999
GB A1 2319424	20-05-1998	GB A0 9703963 JP A2 10148789 SG A1 54472 US A 5808802	16-04-1997 02-06-1998 16-11-1998 15-09-1998
WD A1 9429761	22-12-1994	keine - none - rien	
WD A1 9722033	19-06-1997	AU A1 10387/97 DE C0 69603374 EP A1 865626 EP B1 865626 GB A0 9326672 US A 5936774 GB A0 9525223 US A 5712732 WD A2 9420875 WD A3 9420875 EP A1 687366 GB A0 9400087 GB A0 9324141 GB A0 9322579 GB A0 9314419 GB A0 9307638 GB A0 9304279	03-07-1997 26-08-1999 23-09-1998 21-07-1998 25-02-1996 10-08-1999 07-02-1996 27-01-1998 15-09-1994 12-01-1995 20-12-1995 02-03-1994 12-01-1994 25-12-1993 25-08-1993 02-06-1993 21-04-1993
WD A1 9841893	24-09-1998	AU A1 65690/98	12-10-1998

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